Patent claims

1. A multichip circuit module having a main circuit board (9), at least one carrier substrate (1) which is mounted on the main circuit board (9) and which is in electrical contact with the main circuit board (9), and at least one semiconductor chip (5) on the carrier substrate (1) which is in electrical contact with the carrier substrate (1),

- the carrier substrate (1) having at least one cavity (4) on a mounting surface to accommodate at least one semiconductor chip (5),

- connecting contacts (6) for associated bumps (7) of the semiconductor chip (5) being provided in the cavity (4),

- the at least one semiconductor chip (5) being mounted on the connecting contacts (6) by using the bumps (7) in the flip-chip technique,
and
- the mounting surface (3) of the carrier substrate (1) being applied to a contact surface (10) of the main circuit board (9), a filling material (11) being provided between the contact surface (10) of the main circuit board (9) and the mounting surface (3) of the carrier substrate (1), characterized in that the carrier substrate (1) has many layers with conductor tracks (2) extending transversely through a plurality of layers, and the filling material (11) makes contact with the rear of the semiconductor chips (5) in the cavities (4) without enclosing the connecting contacts (6) and bumps (7).

2. The multichip circuit module as claimed in claim 1, characterized in that the filling material (11)

is an anisotropically conductive material, for example an anisotropically conductive paste or an anisotropically conductive film.

3. The multichip circuit module as claimed in claim 1 or 2, characterized in that the filling material (11) does not fill the interspaces of the cavities (4) completely.

4. The multichip circuit module as claimed in one of the preceding claims, characterized in that conductor tracks (2) of the carrier substrate (1) are led to the mounting surface (3) and are connected electrically and mechanically to conductor tracks (12) of the main circuit board (9) for the simultaneous carrying of signals, dissipation of heat, encapsulation and shielding.

5. The multichip circuit module as claimed in one of the preceding claims, characterized by a planar antenna arrangement (8) on the underside of the carrier substrate (1), which is opposite the mounting surface (3).

6. The multichip circuit module as claimed in one of the preceding claims, characterized in that the carrier substrate (1) is a multilayer ceramic, in particular a low-temperature co-fired ceramic (LTCC).

7. A method for the production of multichip circuit modules as claimed in one of the preceding claims, having the following steps:

a) letting the at least one semiconductor chip (5) into cavities (4) provided for the semiconductor chips (3) on a mounting surface (3) of the carrier substrate (1);

b) mounting the at least one semiconductor chip (5) in the flip-chip technique by making contact with bumps (7) of the semiconductor chips (5) resting on connecting contacts (6) in the cavities (4);

c) applying a layer of filling material (11) to the contact surface (10) of the main circuit board (9); and

d) applying the carrier substrate (1) having the mounting surface (3) to the contact surface (10) of the main circuit board (9).

8. The method as claimed in claim 7, characterized by application of an anisotropically conductive filling material (11), in particular a paste or a film, to the contact surface as the filling material (11).

9. The method as claimed in claim 7 or 8, characterized by application of the filling material layer (11) in a layer thickness which is matched in such a way that interspaces of the cavities (4) are not filled completely with the filling material (11).

10. The method as claimed in one of claims 7 to 9, characterized by electrical connection of conductor tracks (2), which extend transversely through a plurality of layers of the carrier substrate (1) and are led to the mounting surface (3), to conductor tracks (12) of the main circuit board (9).

11. The method as claimed in one of claims 7 to 10, characterized by production in a gas atmosphere in order to enclose gas in the cavities (4).